CLAIMS

1. A process for forming a semiconductor film, comprising the steps of:

applying a semiconductor particle dispersion liquid to a substrate surface by spray coating in such a manner that the atomized droplets of the dispersion liquid discharged from the spray coater have a mean diameter of 30 μm or less; and

drying the coating to form a porous semiconductor film.

2. The process according to claim 1, wherein the substrate is a thermoplastic resin substrate.

3. The process according to claim 2, wherein the thermoplastic resin substrate is a high polymer film.

4. The process according to claim 1, wherein the semiconductor particle dispersion liquid is a dispersion in methanol and/or ethanol of particles of at least one semiconductor selected from the group consisting of metal oxides, perovskites, metal sulfides and metal chalcogenides.

5. The process according to claim 4, wherein the semiconductor particles are titanium oxide particles.

6. The process according to claim 5, wherein the titanium oxide particles are anatase-type titanium oxide particles.

7. The process according to claim 1, wherein the semiconductor particle dispersion liquid has a solids content of about 1 wt.% to about 40 wt.%.

8. The process according to claim 1, wherein the semiconductor particle dispersion liquid has a viscosity of about

0.001 Pa·sec to about 2 Pa·sec.

9. The process according to claim 1, wherein the atomized droplets of the dispersion liquid discharged from the spray coater have a mean diameter of about 1 μm to about 25 μm.

10. The process according to claim 1, wherein the coating is dried by heating at a temperature of about 200°C or lower or by irradiation with electromagnetic waves.

11. The process according to claim 10, wherein the coating is dried by microwave irradiation.

12. A photocatalyst comprising a porous semiconductor film formed on a substrate by the process according to claim 1.

13. The photocatalyst according to claim 12, wherein the porous semiconductor film is a porous titanium oxide film.

14. The photocatalyst according to claim 13, wherein the porous titanium oxide film is a porous anatase-type titanium oxide film.

15. A photoelectrode for dye-sensitized solar cells, comprising a porous semiconductor film formed by the process according to claim 1 on an electrically conductive transparent layer formed on either a glass plate or a transparent high polymer film.

16. The photoelectrode according to claim 15, wherein the porous semiconductor film is a porous titanium oxide film.

17. The photoelectrode according to claim 16, wherein the porous titanium oxide film is a porous anatase-type titanium oxide film.